

Ann. Geophys. Discuss., referee comment RC2
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Comment on angeo-2020-90

Anonymous Referee #2

Referee comment on "On the semi-annual variation of relativistic electrons in the outer radiation belt" by Christos Katsavrias et al., Ann. Geophys. Discuss.,
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This paper shows new statistical results about the semi-annual variation (SAV) of electron fluxes during solar cycle 24. The authors show that the SAV is mainly explained by the Russel-McPherron effect, and is well correlated with high HSS occurrences. They show that most findings from solar cycles 22 and 23 also apply to solar cycle 24.

These results are of great interest for the radiation belt modelling community. The paper is clear and well written. The figures are mostly clear and appropriate.

I recommend this article for publication, subject to the following minor remarks and questions:

Eq 1,2,3 : some notations are not explained (the star in ϕ^* in eq. 1, and what is W_n in eq. 2 and 3)

Section 2.2.3 is not very clear, in particular the first sentence. Later in the article the WTC seems to be used as an indicator for the confidence in the XWT phase. It could help to rephrase this section a bit more clearly, and explicit how this metric is used in this study.

Line 114: How was averaging done (linear or logarithmic average), and how were the data gaps accounted for?

Line 140: How statistically significant is this analysis for the 2009-2014 period?

Figure 4-7: An horizontal line or indicator at 175 days would help illustrate the discussions. Since all discussions focus on the SAV, why not present only the 175 days

horizontal cuts (or a small band around there) of these plots?

Line 167: I think there is part of the sentence missing there, do they show that this number correlated with SAV?

Line 194: "The phase relationship [...] is only significant during the descending phase of SC24". Why is that? Is it because the Wavelet coherence is above 95%?

Line 271: While SAV could in principle be integrated in specification models, it should be noted that these relatively short-scaled dynamics are only of interest for very specific missions (for instance EOR or short-lived nanosats).